

## FOR IMMEDIATE RELEASE

### New SmartLink™ Miniaturized Instruments for Precision RTD Temperature Measurements

Cleveland, Ohio -- June 8, 1998 -- Keithley Instruments, Inc. announces two new SmartLink instruments, the models KNM-RTD31 and KNM-RTD32, for making PC-based laboratory-grade temperature measurements from RTDs in virtually any plant, field, or laboratory location. The KNM-RTD31 can measure a single-ended RTD or 4-wire RTD and has two digital outputs. The KNM-RTD32 is a self-contained, signal-conditioning instrument for up to eight single-ended, or four 4-wire RTDs and also has two digital outputs. Both models can also be used for general-purpose resistance measurements. Because the KNM-RTD31 and -32 are so small (6.7 x 1.3 x 1.1 inches), they can be located only inches away from demanding signals and sensors, minimizing lead length errors and induced electrical noise.

#### High-Precision Analog-to-Digital Conversion

Both the KNM-RTD31 and -32 feature a high-precision, 20-bit sigma-delta analog-to-digital converter that delivers seven readings per second at full accuracy. The miniaturized instruments' onboard reading memory can buffer up to 10,000 8-bit readings or 5,000 16-bit readings. Standard capabilities include digital filtering, peak measurements, limits, and mX+b scaling.

#### Technical Specifications

When measuring inputs from a 100W type 385 or 3916 4-wire RTD (-200°C to 800°C), the KNM-RTD31 and -32 provide 24-hour accuracy of  $\pm 0.019^\circ\text{C}$  and five-year accuracy of  $\pm 0.13^\circ\text{C}$  in the -200°C to 70°C range. Resolution is  $\pm 0.001^\circ\text{C}$  over the RTD's entire measurement range. The instruments' four 4-wire resistance measurement ranges are 200W, 2 kW, 20kW, and 200kW. In the 200W range, the instruments provide 24-hour accuracy of  $\pm 0.0026\% + 5\text{mW}$  with  $\pm 1\text{mW}$  resolution. The instruments' three 2-wire resistance measurement ranges are 2MW, 20MW, and 200MW.

#### Software and Programming

Each SmartLink instrument comes with Keithley's NetAcq start-up software to help get the instrument up and running within minutes. The start-up package is a fully functional, stand-alone Windows-based package that will run on any PC. Basic data acquisition functions, including configuration, logging, trending, and data storage are supported. Drivers are available for popular man-machine (process oriented), data acquisition (Windows-based

GUI) and language-based (Visual Basic, C, Pascal) application software packages.

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KNM-TC41  
KNM-TC42

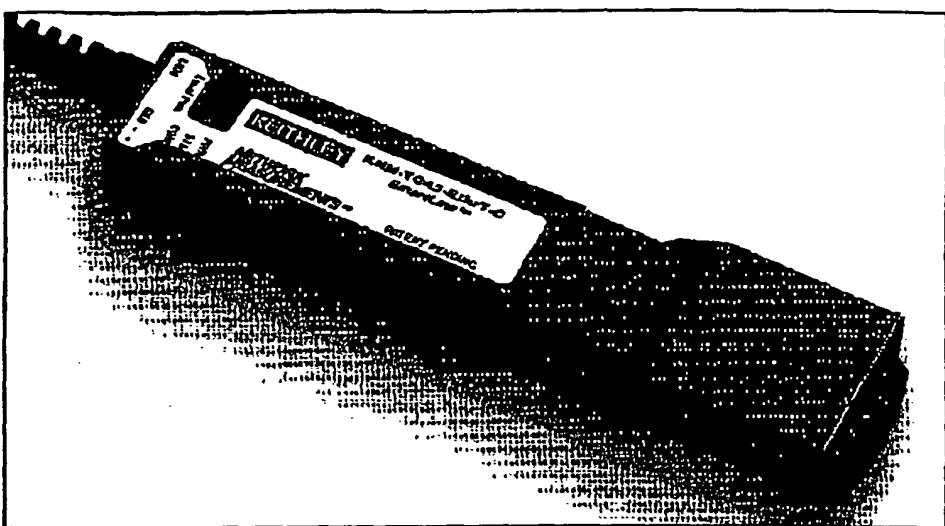
## Isolated Precision Thermocouple

## FEATURES

- 1500V isolation, 4000V inputs
- Comprehensive measuring solution for: thermocouples, millivolts, digital input on any channel
- Throughput to 15 rdgs/sec
- Six 2-wire or three 4-wire fully isolated channels
- 1 digital output
- 24 hour accuracy  $\pm 0.0028\%$
- 5 year warranty
- 5 year  $\pm 30^\circ\text{C}$  accuracy  $\pm 0.1\%$ FS
- Miniature package

## APPLICATIONS

- Process monitoring
- Production test
- Product reliability testing
- Temperature measurements
- High accuracy data acquisition systems
- Existing network upgrades



## Functional Description

The Models TC41 and TC42 are isolated, high precision, general-purpose measuring instruments designed for computer-based systems in field, factory and laboratory applications. A wide array of communication interfaces provide measurements to any network. Up to six differential or three 4-wire inputs in any combination are accommodated by the Model TC42. The Model TC41 accommodates one differential, 4-wire, or digital input. Both models have one solid state relay digital output. Any input channel can be defined as any of the standard input types: DC millivolts, thermocouple, or digital input. A high precision, 20-bit sigma-delta A/D converter delivers up to 15 readings per second at full accuracy. Onboard reading memory can buffer up to 10,000 8-bit readings or 5,000 16-bit readings.

## Software and Programming

NetAcq start up software is provided with each instrument to help get the instrument up and running within minutes. Basic data acquisition functions, including configuration, logging, trending and data storage, are supported. The start-up package is a fully functional, stand-alone Windows-based package that will run on any PC.

In the event that NetAcq does not provide the required application functionality, Keithley provides the software links to enable a quick integration into many application software packages. Drivers are available for the most popular Man-Machine Interface (process-oriented), data acquisition (Windows-based graphical interface), and language-based (Visual Basic, C, Pascal) software. The SmartLink software structure also automatically accommodates all of the communication protocols available to simplify the integration process further.

## Communications

SmartLink Instruments are designed for simple system interfacing. Instruments are factory configured for the communications type ordered and all connections are made using industry standard terminations appropriate for a particular network.

System start-up and debug often require frequent trips to the server location and the measurement site. Using the Multimeter Interface accessory, it's possible to operate the instrument from the built-in accessory port without connecting it to the network communications port. Both devices come pre-loaded with software that accesses all instrument functions.

STANDARD FEATURES\*

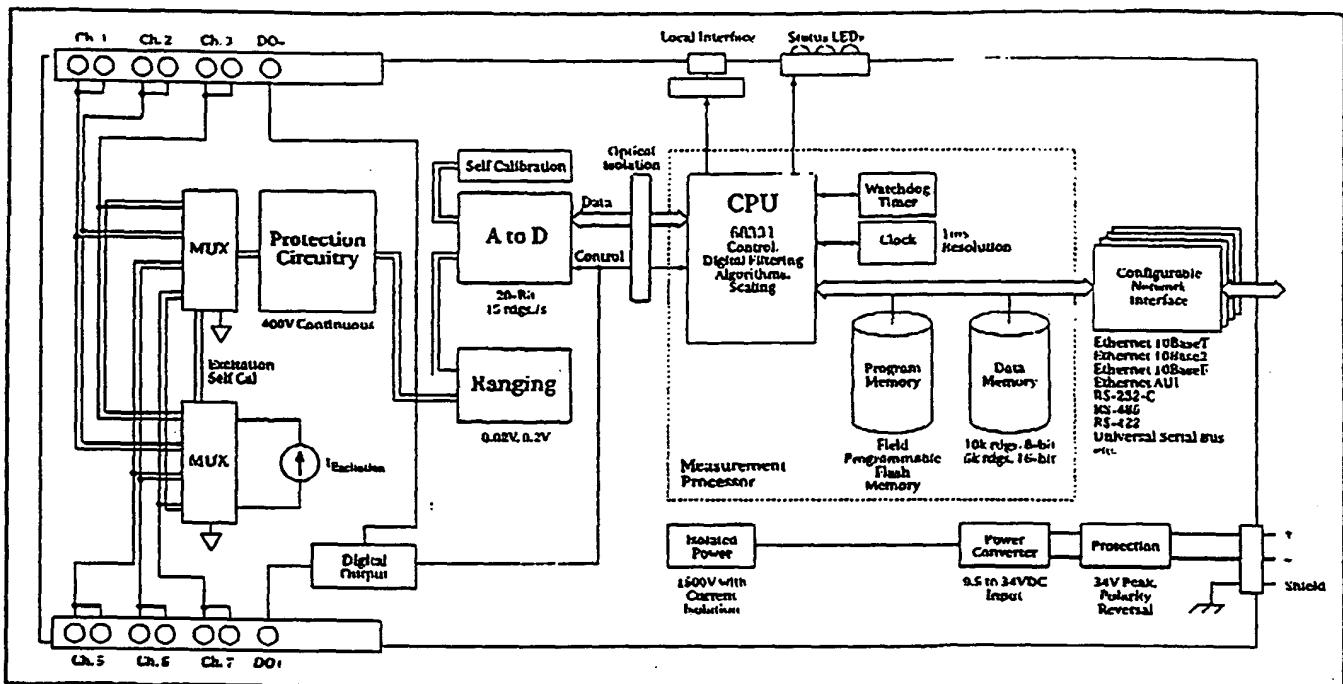
Limits: Two, high or low per channel; can be associated with a digital output.  
 Scaling: Zero, span, or mX+b with units per channel.  
 Statistics: Maximum and minimum readings per channel.  
 Scanning: Time interval, on command, and level triggered scans. Set number of scans and pre-trigger percent.  
 Data Fields: Configure readings by value, channel number, channel tag, units, reading number, time & date, and/or limit status.  
 Data Storage: Configure reading, memory size and resolution; all or selected scans; wrap or stop when full; ASCII or binary.  
 \* Refer to the Command Map, a comprehensive overview of the SmartLink command set.

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To <i>Don Natick</i>		From <i>B. Heinen</i>	
Co./Dept. <i>Frd</i>		Co. <i>Keithley</i>	
Phone # <i>313-846-8471</i>		Phone # <i>440-498-2720</i>	
Fax # <i>319-323-7553</i>		Fax # <i>440-248-6168</i>	

IONS?  
115 (U.S. only)  
Technical assistance,  
ordering information.

**KNM-TC41**  
**KNM-TC42**

## Isolated Precision Thermocouple



### ORDERING INFORMATION

#### Isolated Thermocouple

- KNM-TC41-RS-232-C
- Single-Channel RS-232-C
- KNM-TC42-RS-232-C
- Multi-Channel RS-232-C
- KNM-TC41-RS-422-C
- Single-Channel RS-422
- KNM-TC42-RS-422-C
- Multi-Channel RS-422
- KNM-TC41-RS-485-C
- Single-Channel RS-485
- KNM-TC42-RS-485-C
- Multi-Channel RS-485
- KNM-TC41-EtherT-C
- Single-Channel Ethernet 10BaseT
- KNM-TC42-EtherT-C
- Multi-Channel Ethernet 10BaseT
- KNM-TC41-Ether2-C
- Single-Channel Ethernet 10Base2
- KNM-TC42-Ether2-C
- Multi-Channel Ethernet 10Base2
- KNM-TC41-EtherA-C
- Single-Channel Ethernet AUI
- KNM-TC42-EtherA-C
- Multi-Channel Ethernet AUI
- KNM-TC41-EtherF-C
- Single-Channel Ethernet 10BaseF
- KNM-TC42-EtherF-C
- Multi-Channel Ethernet 10BaseF

### ORDERING INFORMATION

#### Options

- KNM-CALDATA-DCV41/42
- Calibration Data
- Accessories
- KNM-MMI-100
- Multimeter Interface
- KNM-MMI-120
- Enhanced Multimeter Interface
- KNM-MMI-KIT
- Multimeter Interface Kit
- KNM-PS-MOD-40-AC
- 40 Watt, 90-264 VAC Power Supply
- KNM-PS-WALL-9-ACUS
- 9 Watt, 120 VAC Power Supply
- KNM-PS-WALL-9-ACEU
- 9 Watt, 240 VAC Power Supply
- KNM-PS-MOD-9-DC12
- 9 Watt, 8-15 VDC Power Supply
- PS-CONN01
- KNM-Power Supply Connector
- KNM-DINMT
- DIN Mounting Assembly
- KNM-SCWMT
- Screw-In Panel Mount
- KNM-VELMT
- Velcro® Mount
- KNM-DCI-KIT
- Resistor Kit for measuring current

### Configuration

Very little instrument configuration is required. After the appropriate type of instruments for a particular measurement is determined, the communications interface, power supply and mounting scheme must be selected. Interfaces are all factory installed and configured to order. For the power supply, determine the total system load needed in watts, then select the appropriate unit or provide another source of power (9.5-34 VDC).

### Installation

The form factors of conventional instruments and system components normally dictate the physical and electrical characteristics of a system. Long analog wiring runs or racks of equipment in the field are often required. Smart-Link Instruments impose no such restrictions. It's possible to put network nodes at measurement sites and still get instrument-grade readings. Instruments can mount on a DIN rail, screw to a panel, be placed in a wiring tray, or be located virtually anywhere a source of power (9.5-34 VDC) and a network connection can be found. This permits a wide range of system configurations that can easily be rearranged to suit changing needs. Because of their small size, instruments can often be placed in junction boxes or within electrical panels if environmental protection is required. Environmentally hardened enclosures are also available.

### QUESTIONS?

1-800-552-1115, (U.S. only)  
Call toll free for technical assistance,  
product support or ordering information.

KNM-TC41  
KNM-TC42

## Isolated Precision Thermocouple

ACCURACY & RESOLUTION<sup>1</sup>

FUNCTION	RANGE	5 YEAR ACCURACY <sup>1</sup>	24 HR. ACCURACY <sup>2</sup>	RESOLUTION
DC VOLTS*	20 mV	±0.11 % + 20 µV	±0.05 % + 2.5 µV	1100 nV
	200 mV	±0.093 % + 80 µV	±0.093 % + 8.0 µV	

THERMOCOUPLES<sup>3</sup>

Type J	-200°C to + 760°C	+1.85 °C	±0.4 °C	±0.01 °C
Type K	-200°C to + 1350°C	+1.7 °C	±0.4 °C	±0.01 °C
Type K	+250°C to + 1767°C	+3.6 °C	±0.6 °C	±0.01 °C
Type E	-200°C to + 1000°C	+2.7 °C	±0.7 °C	±0.01 °C
Type S	+200°C to + 1760°C	+3.4 °C	±0.6 °C	±0.01 °C
Type K	-200°C to + 1300°C	+1.7 °C	±0.4 °C	±0.01 °C
Type N	-200°C to + 1300°C	+1.7 °C	±0.4 °C	±0.01 °C
Type B	+250°C to + 1020°C	+1.0 °C	±0.4 °C	±0.01 °C

If running at higher speeds, add noise &amp; max. speed from chart below.

To adjust for intermediate temperature range or time, add values below to 24 hour accuracy.

<sup>1</sup> Accuracy specifications include the effects of non-linearity, hysteresis and non-repeatability over T<sub>meas</sub>, 130°C range for 5 years, T<sub>cal</sub> = 23 ± 3°C.<sup>2</sup> Accuracy specifications include the effects of non-linearity, hysteresis and non-repeatability over T<sub>meas</sub>, ±1°C range for 24 hours, T<sub>cal</sub> = 23 ± 3°C.<sup>3</sup> Specifications for horizontal mounting in still air. Add 10.3°C uncertainty for other mounting, or recalibrate to eliminate uncertainty.<sup>4</sup> All accuracies include instrument errors such as A/D errors, reference junction errors and conformity errors. Sensor errors cannot be predicted and therefore are not included.<sup>5</sup> Specifications for 25 reading avg.<sup>6</sup> Specifications for 0 reading avg.<sup>7</sup> 5 year thermocouple specs apply for measurements from -100°C to +100°C. For measurements outside this range, see adjoining stability table.

STABILITY <sup>1,2</sup> FUNCTION/ RANGE	±1°C	TEMPERATURE COEFFICIENT <sup>4</sup> ADDITIONAL ERROR AT AMBIENT OF			TIME STABILITY <sup>1,2</sup> ADDITIONAL ERROR AFTER				NOISE <sup>5</sup> @ MAX. SPEED	
		±6°C	±10°C	±30°C	90 DAYS	1 YEAR	2 YEARS	5 YEARS	RDMS	PK-PK
DC VOLTS										
20 mV	±0.0%	±0.013% + 0.5 µV	±0.026% + 1 µV	±0.074% + 3 µV	±0.0088%	±0.014%	±0.020%	±0.033%	0.22 µV	21 µV
200 mV	±0.0%	±0.017% + 1 µV	±0.022% + 6 µV	±0.070% + 30 µV	±0.0037%	±0.01%	±0.017%	±0.028%	2.2 µV	21 µV
<b>THERMOCOUPLES</b>										
Type J (-210°C to + 760°C)	±0.0 °C	±0.0 °C	±0.27 °C	±1.0 °C	±0.06 °C	±0.14 °C	±0.20 °C	±0.25 °C	0.008 °C	0.04 °C
-100°C to + 100°C	±0.0 °C	±0.05 °C	±0.36 °C	±1.1 °C	±0.09 °C	±0.18 °C	±0.26 °C	±0.35 °C	0.03 °C	0.23 °C
-200°C to + 760°C	±0.0 °C	±0.05 °C	±0.36 °C	±1.1 °C	±0.09 °C	±0.18 °C	±0.26 °C	±0.35 °C	0.03 °C	0.23 °C
Type K (-270°C to + 1372°C)	±0.0 °C	±0.06 °C	±0.29 °C	±1.1 °C	±0.07 °C	±0.14 °C	±0.2 °C	±0.27 °C	0.012 °C	0.06 °C
-200°C to - 100°C	±0.0 °C	±0.06 °C	±0.28 °C	±1.0 °C	±0.06 °C	±0.13 °C	±0.19 °C	±0.25 °C	0.009 °C	0.05 °C
-100°C to + 100°C	±0.0 °C	±0.06 °C	±0.28 °C	±1.0 °C	±0.06 °C	±0.13 °C	±0.23 °C	±0.31 °C	0.009 °C	0.05 °C
-200°C to + 1350°C	±0.0 °C	±0.22 °C	±0.63 °C	±1.9 °C	±0.16 °C	±0.29 °C	±0.43 °C	±0.57 °C	0.035 °C	0.17 °C
Type E (0°C to + 1760°C)	±0.0 °C	±0.28 °C	±0.78 °C	±2.3 °C	±0.17 °C	±0.29 °C	±0.44 °C	±0.58 °C	0.11 °C	0.56 °C
+250°C to + 1767°C	±0.0 °C	±0.28 °C	±0.78 °C	±2.3 °C	±0.17 °C	±0.29 °C	±0.44 °C	±0.58 °C	0.11 °C	0.56 °C
Type B (-270°C to + 1000°C)	±0.0 °C	±0.0 °C	±0.29 °C	±1.1 °C	±0.07 °C	±0.15 °C	±0.21 °C	±0.28 °C	0.008 °C	0.04 °C
-200°C to + 1000°C	±0.0 °C	±0.09 °C	±0.49 °C	±1.4 °C	±0.12 °C	±0.22 °C	±0.31 °C	±0.46 °C	0.032 °C	0.17 °C
-200°C to + 1350°C	±0.0 °C	±0.09 °C	±0.49 °C	±1.4 °C	±0.12 °C	±0.22 °C	±0.31 °C	±0.46 °C	0.032 °C	0.17 °C
Type S (0°C to + 1760°C)	±0.0 °C	±0.28 °C	±0.65 °C	±2.1 °C	±0.17 °C	±0.30 °C	±0.45 °C	±0.71 °C	0.02 °C	0.1 °C
+200°C to + 1767°C	±0.0 °C	±0.28 °C	±0.65 °C	±2.1 °C	±0.17 °C	±0.30 °C	±0.45 °C	±0.71 °C	0.02 °C	0.1 °C
Type T (-270°C to + 390°C)	±0.0 °C	±0.0 °C	±0.26 °C	±1.0 °C	±0.06 °C	±0.13 °C	±0.19 °C	±0.24 °C	0.006 °C	0.03 °C
-100°C to + 100°C	±0.0 °C	±0.0 °C	±0.26 °C	±1.0 °C	±0.06 °C	±0.13 °C	±0.19 °C	±0.24 °C	0.006 °C	0.03 °C
-200°C to + 390°C	±0.0 °C	±0.06 °C	±0.31 °C	±1.1 °C	±0.07 °C	±0.15 °C	±0.21 °C	±0.29 °C	0.020 °C	0.12 °C
Type N (-200°C to + 100°C)	±0.0 °C	±0.1 °C	±0.29 °C	±1.2 °C	±0.06 °C	±0.12 °C	±0.18 °C	±0.26 °C	0.014 °C	0.07 °C
-100°C to + 100°C	±0.0 °C	±0.1 °C	±0.29 °C	±1.2 °C	±0.06 °C	±0.12 °C	±0.17 °C	±0.23 °C	0.014 °C	0.07 °C
-200°C to + 1300°C	±0.0 °C	±0.2 °C	±0.56 °C	±1.7 °C	±0.14 °C	±0.25 °C	±0.37 °C	±0.57 °C	0.04 °C	0.18 °C
Type B (+250°C to + 1820°C)	±0.0 °C	±0.1 °C	±0.3 °C	±1.5 °C	±0.1 °C	±0.2 °C	±0.25 °C	±0.5 °C	0.16 °C	0.8 °C
+200°C to + 1767°C	±0.0 °C	±0.1 °C	±0.3 °C	±1.5 °C	±0.1 °C	±0.2 °C	±0.25 °C	±0.5 °C	0.16 °C	0.8 °C

<sup>1</sup> Maximum uncertainty for Offset Comp. ON. 8 reading filter. Typical accuracy is better.<sup>2</sup> This uncertainty already included in 5 Year accuracy spec.<sup>3</sup> Typical.

Accuracy = 24 hour accuracy + time stability + temperature stability + noise.

Note: Noise figure is necessary only if operating above specified averaging filter setting.

e.g. Type K (measuring 23°C), 90 day, ±5°C accuracy at max. speed = 0.4°C + 0.06°C + 0.006°C = 0.626°C.